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163922

SITE ASSESSMENT REPORT
FOR
GENERAL DIE CASTING
DETROIT, WAYNE COUNTY, MICHIGAN
TDD # T05-9201-036
PAN # EMI1286SAA

March 25, 1992

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Contract No.: 68-WO-0037

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ecology and environment, inc.

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International Specialists in the Environment

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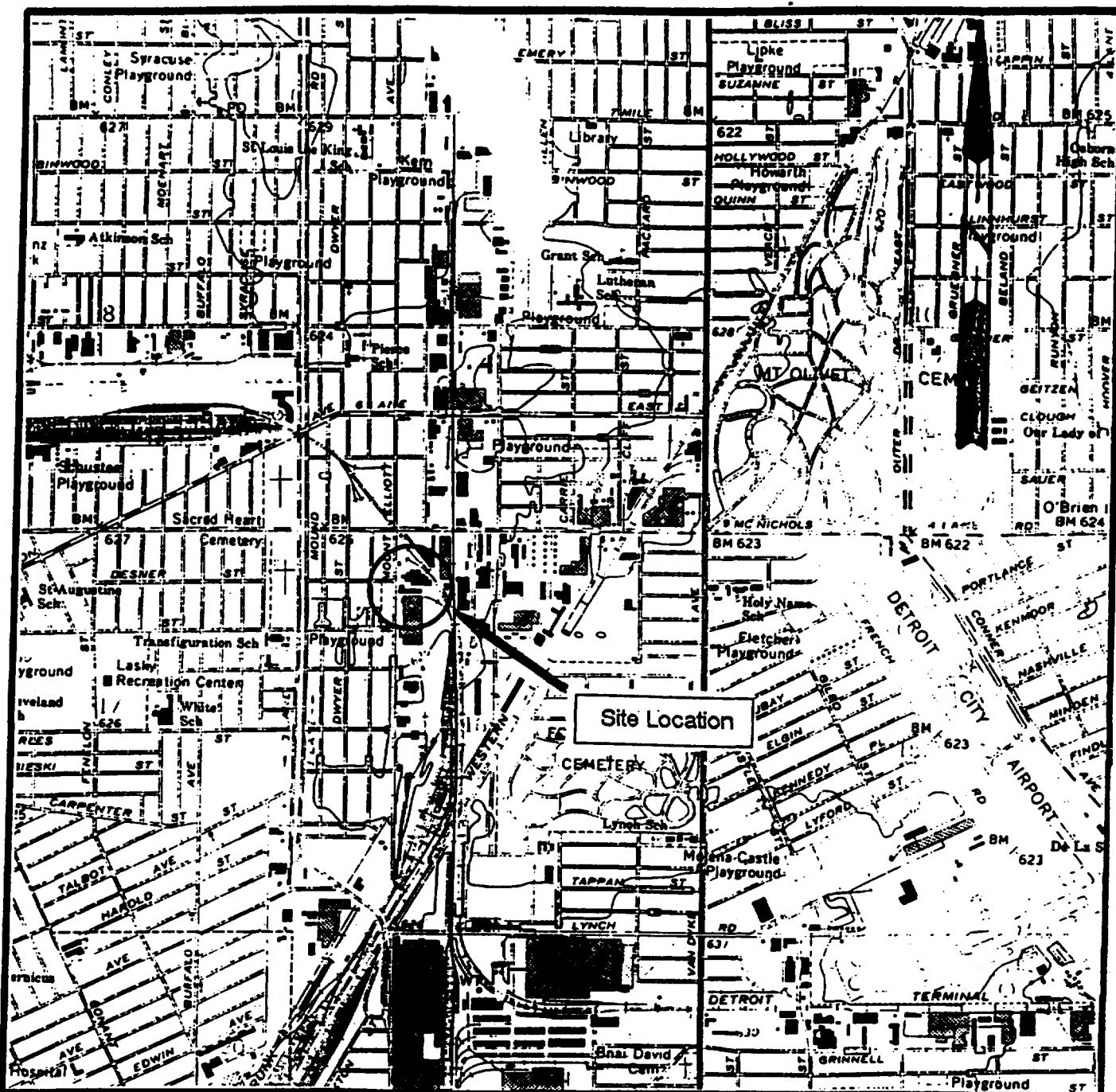
1.0 INTRODUCTION

On January 29, 1992, the United States Environmental Protection Agency (U. S. EPA), by Technical Directive Document (TDD) number T05-9201-036, tasked Ecology and Environment, Inc. (E & E) Technical Assistance Team (TAT) to perform a site assessment, including site sampling, and evaluating the site's threat to human health and the environment based on the Title 40 Code of Federal Regulations (CFR) 300.415. This report summarizes these activities.

2.0 BACKGROUND

General Die Casting is located at 13700 Mt. Elliott, Detroit, Wayne County, Michigan (Figure 1). The site is a 21,250 square foot building located on 0.6 acres (Figure 2). The company manufactured and electroplated zinc die castings. According to files acquired from the Michigan Department of Natural Resources (MDNR) representative Mr. Mike Stenzel, as of March 3, 1991 the company was owned by Mr. Richard Shirley and Mr. Julian Steenkiste. The facility is in an industrial area with the closest residential areas being approximately one-quarter mile to the west and north. General Die Casting attempted to get a Clean Closure from the MDNR so that it could be sold to Spartan Metal Finishing, 5400 E. Nevada, Detroit, Michigan (Mr. Bill Aikens). General Die Casting had a private contractor file for the closure. The contractor was Toxico Corp., 26711 Northwestern Highway, Suite 128, Southfield, Michigan (Mr. Robert Houghton). In the Clean Closure request, Toxico identified oil contamination along the south exterior of the General Die Casting building as caused by a previous owner of the building who was not identified. Toxico then excavated the contaminated soils for disposal. The eventual fate of the excavated soils is unknown at this time.

Concerned about the situation, the neighbor to the south of General Die Casting, Central Steel and Wire, 13400 Mt. Elliott, hired Gabriel Laboratories, 1421 N. Elston, Chicago, Illinois (Mr. Steve Sawyer), to test the excavated soil and ground water. Gabriel Laboratories found

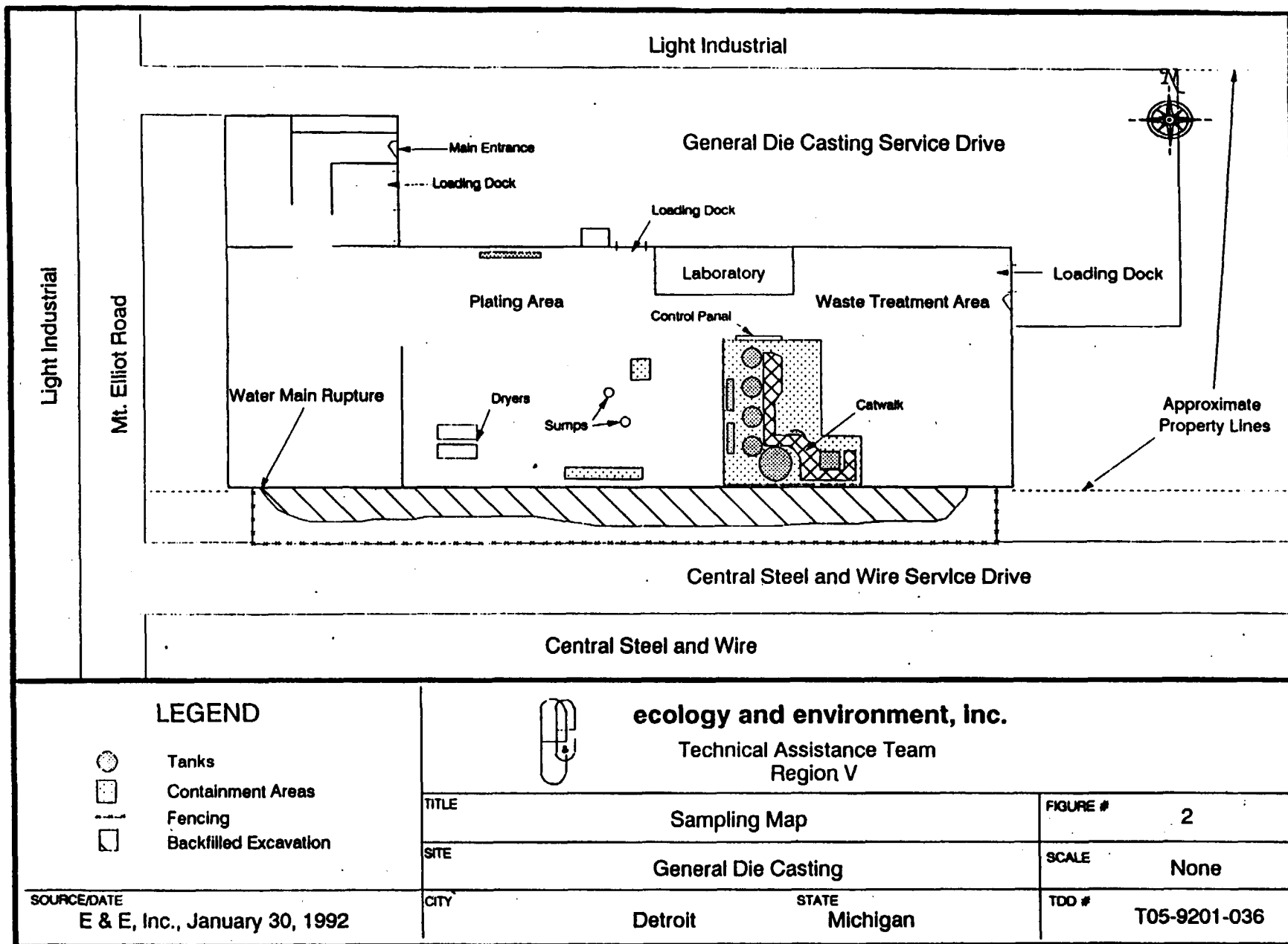


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Technical Assistance Team
Region V

TITLE	Site Location Map	FIGURE #	1
SITE	General Die Casting	SCALE	1:24,000
SOURCE/DATE	March 2, 1992	TDD #	T05-9201-036
CITY	Detroit	STATE	Michigan

SOURCE/DATE
USGS 7.5 Minute Series
(Topographic) Quadrangle



significant amounts of cyanide in the soil samples. On February 11, 1991 Gabriel Laboratories sent a letter to Mr. Mike Stenzel of the MDNR requesting a denial of the Clean Closure for General Die Casting. The MDNR then collected soil samples. MDNR analytical results on soil samples from the excavated area indicated cyanide concentrations of 755 to 1673 parts per million (ppm) along with significant amounts of nickel, copper, and zinc, all of which are common materials used in a zinc die cast plating facility. Neither General Die Casting or Toxico had reported cyanide contamination when filing for closure until after being confronted by the MDNR.

On December 21, 1990, the U. S. EPA and the TAT performed a site investigation. Upon arrival at the facility, the TAT encountered Spartan Metal Finishing personnel removing equipment from within the building. The TAT entered the building dressed in Level B protection since the air quality inside was unknown. Bill Aikens and Richard Shirley accompanied the TAT during the inspection in street clothes despite the TAT's warnings regarding the unknown air quality inside the facility. Organic vapor analyzer (OVA) readings in the western portion of the building were 20 to 30 ppm above background. Methane from an extinguished furnace pilot was suspected as the cause. Spartan and General Die Cast personnel ignored the TAT warnings of impure air and remained in the building for the duration of the inspection. Approximately 22 drums and twelve tanks containing solids and liquids were encountered throughout the building's interior. The waste treatment containment area (Figure 2) was covered with two to three inches of green, flaky sludge. The excavation area to the south of the building was unfilled and unsecured. Based on information gathered during the assessment, a Unilateral Administrative Order was issued on July 3, 1991 to Bill Aikens of Spartan Metal Finishing to perform a remediation of the General Die Casting facility.

On May 3, 1991, the TAT along with U. S. EPA Attorney Jim Sias again visited the site. Mr. Richard Shirley and Mr. Bill Aikens accompanied the team. An OVA sweep of the building showed no readings above background. During this inspection, the TAT noted that the 22 drums and

some of the equipment identified during the December 21 site assessment had been removed. The only containers remaining in the facility were the waste treatment tanks and a few tanks in the plating area (Figure 2). Most of these tanks still contained significant amounts of liquids and sludges. Most of the green flaky sludge noted during the site assessment had been removed from the treatment area. The excavation area to the south of the building had been backfilled and secured with fencing. No information has been made available to the U.S. EPA regarding the level of contamination of the soils at the base of the excavation prior to backfill. Information regarding the fate of the missing drums, treatment area sludge, and excavated soils are also not available at this time.

3.0 SITE ACTIVITIES

On January 28, 1992, the U. S. EPA mobilized the TAT to perform an emergency response and site reassessment at the General Die Casting site. The neighboring facility to the south, Central Steel and Wire, reported liquid escaping from the General Die Casting building. U. S. EPA On-Scene Coordinators (OSCs) Pete Guria and Bob Bowlus contacted Bill Aikens who allowed the OSCs and TAT members Herb Langer, Bill Wilde, and Sam Sirhan access to the building. The liquid escaping the building was traced to a broken water main which fed the fire system of the building. The U. S. EPA and the TAT then inspected the rest of the facility. TAT member Langer noted that the condition of the site was unchanged from the May 3 inspection. OSC Guria then directed the TAT to prepare a sampling plan to determine the amount and type of hazardous substances present in the building and update the threat to the public health and the environment.

On February 10, 1992, the TAT returned to the site to implement the sampling plan. TAT members Doug Dunderman and Herb Langer and OSC Pete Guria were granted access to the building by Bill Aikens. All sampling was completed based on the developed sampling plan (Appendix A). Sample locations are shown in Figure 3. The two tanks used by General Die Casting to treat their cyanide affluent contained approximately 650

gallons each. A tank used for treatment of chromium waste streams contained approximately 850 gallons of liquid. The one small tank along the south wall contained about 40 gallons of unknown liquid. Samples were taken from each of these tanks. Samples were also taken from residues and sludges found in other tanks, sumps, and containment areas (Figure 3).

During sampling, General Die Casting representative Bob Murray arrived to discuss the uses of different tanks and areas of the facility.

Immediately on entry, Mr. Murray informed TAT member Langer that most tanks in the treatment area likely contained "F006 waste" which 40 CFR 261.31 describes as waste water treatment sludges from an electroplating operation which contain chromium, cadmium, and cyanides. He also noted that the portion of the south wall, where visible staining could be seen on the outside, was used for cyanide copper solution spill containment. None of the containment areas were lined to prevent seepage of spillage from tanks through the concrete slab and cement block. Separation of the concrete slabs and building walls was evident in many areas of the building and containment areas, including waste treatment, cracking of the slab and block walls was also apparent. It was the opinion of the OSC and the TAT that the walls and floor of the building would not contain a spill of the existing tank contents.

The TAT attempted to collect sample of the fill and underlying soil in the excavation area on the south side of the building. Adverse weather conditions and frozen soil made the sampling impossible with the equipment available. Sampling of this area was therefore suspended until needed.

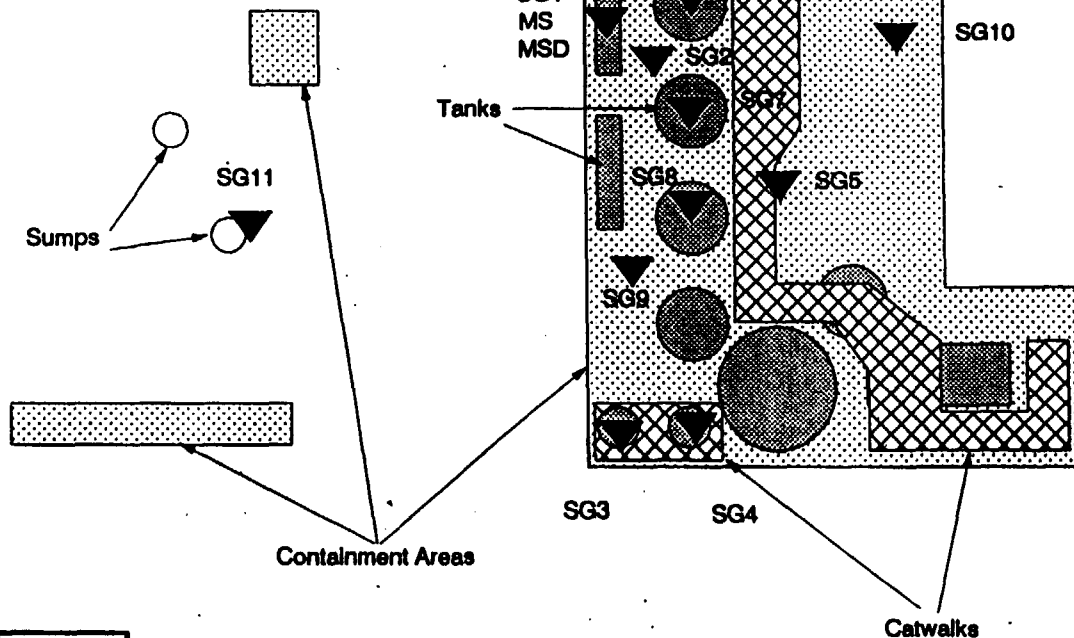
Samples were sent to Clayton Environmental 22345 Roethel Drive, Novi, Michigan for total heavy metal, cyanide, and pH analysis upon completion of the sampling activity and paperwork.



Plating Area

Control Panel

Waste Treatment Area



Legend

SG1, MS, MSD	Green residue, nickel treatment tank.
SG2	White powder, small tank in nickel treatment.
SG3	Black liquid, tank on catwalk in nickel treatment.
SG4	White residue, tank on catwalk in nickel treatment.
SG5	White crystal, pipe below cyanide treatment tanks.
SG6, MS, MSD	Clear liquid, northern cyanide destruct tank.
SG7	Clear liquid, cyanide pH neutralization tank.
SG8	Clear liquid, chrome reduction tank.
SG9	Brown residue, floor of nickel treatment.
SG10	Brown residue, floor of main treatment area.
SG11	Multi-color residue, sump in main plating area.



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Region V

TITLE

Sampling Diagram

FIGURE #

3

SITE

General Die Casting

SCALE

None

SOURCE/DATE

E & E Inc. / March 2, 1992

CITY

Detroit

STATE

Michigan

TDD #

T05-9201-036

4.0 ANALYTICAL RESULTS

Samples taken from the General Die Casting site were retrieved in accordance with the site sampling plan (Appendix A). The samples were analyzed for pH, cyanide, and heavy metals. Samples SG9, SG10, and SG11 were tested for heavy metals using the Toxicity Characteristic Leaching Procedure (TCLP) to determine if the metals in the samples were leachable. All samples were tested for pH to determine their corrosivity (Tables 1 and 2).

Sample SG3 and SG8 were drawn from elevated tanks containing approximately 40 and 850 gallons of solution respectively. Each had a pH of less than or equal to 1.0. The 40 CFR 261.22 describes a hazardous waste as corrosive if it demonstrates a pH of less than 2. These hazardous liquids are contained in poly tanks and are in a position such that if ruptured or tipped over the liquids would spill into the containment area.

Samples SG10 and SG11 contained 607,000 and 5540 milligrams/kilogram of total cyanide, respectively. Sample SG10 was retrieved from the area which contained the green sludge identified during the first December 21, 1990 site assessment, and removed prior to the May 3, 1991 inspection. Sample SG11 was taken from a sump in the plating area. The 40 CFR 261.23 describes a reactive hazardous waste as a substance that is a cyanide bearing waste which when exposed to pH conditions between 2 and 12.5 can generate gasses in a quantity sufficient to present a danger to human health. The reactive sample SG10 was taken from the waste treatment containment area directly under the tank containing 850 gallons of corrosive, acidic liquid identified by sample SG8.

Heavy metals were found in many solid samples (Table 1). Metals expected to be found in samples were chromium and lead because of their use in this type of plating facility. Elevated levels of barium, cadmium, mercury, selenium, and arsenic were also encountered. Most metals were detected in sludges from tanks and on the floors of the facility. All of these materials are considered hazardous to human health if ingested in

sufficient quantity.

Concentrations of metals such as mercury, arsenic, selenium, cadmium, and silver were all found in tank liquids at low concentrations. Chromium and lead were both found in very high concentrations (Table 2). These samples were drawn from tanks containing separated sludges in the bottoms. Those sludges likely contain high concentrations of metal hydroxides which are by-products of the type of waste treatment used at General Die Casting. If these sludges were mixed into the liquid tank samples total metal concentrations in samples might be much higher. All of the metal concentrations exceed the latest proposed maximum contamination levels (MCLs) as outlined in the Title 55 Federal Register 30370, July 25, 1990.

Solid samples with the highest heavy metal concentrations were analyzed using the TCLP to determine if the sampled materials would be considered hazardous based on Title 40 Code of Federal Regulations (CFR) 261. None of the samples exhibited the toxicity characteristic as outlined in 40 CFR 261.24. The TCLP leachate concentrations shown in Table 3 are all below the concentrations which would identify them as a "D" listed waste.

Sample analysis and background information indicates that materials in the General Die Casting facility should be considered as hazardous based on their corrosivity and reactivity. The nature of the materials in tanks and on the floors at the facility identifies them as F006 listed waste. The analytical package and quality assurance review are shown in Appendix B.

General Die Casting Preliminary Sampling Data (Solids)

Table 1

	SG1	SG2	SG4	SG5	SG9	SG10	SG11
	mg/kg*	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
pH (no units)	4.9	6.9	10.3	10.1	5.4	9.5	8.8
Total Cyanide	4.02	13.20	ND	ND	34.5	607,000.0	5,540.0
Mercury	0.44	0.06	ND	0.06	0.45	2.10	1.60
Arsenic	20.00	ND	9.00	ND	10.00	12.00	51.00
Barium	30.00	20.00	ND	ND	150.00	36.00	190.00
Cadmium	30.00	4.00	3.00	ND	10.00	13.00	40.00
Chromium	110.00	70.00	ND	ND	650.00	1800.00	4100.00
Lead	170.00	30.00	20.00	10.00	550.00	220.00	810.00
Silver	3.00	ND	10.00	5.00	9.00	2.00	2.00
Selenium	50.00	30.00	7.00	ND	30.00	100.00	240.00

ND - Not Detected

* - Milligrams per Kilogram

General Die Casting Preliminary Sampling Data (Liquids)

Table 2

	SG3 mg/l*	SG6 mg/l	SG7 mg/l	SG8 mg/l
pH (no units)	less than 1.0	9.0	10.0	less than 1.0
Total Cyanide	ND	ND	ND	ND
Mercury	ND	ND	0.02	ND
Arsenic	0.30	ND	ND	2.10
Barium	0.20	0.10	ND	ND
Cadmium	0.10	ND	ND	0.26
Chromium	4.20	ND	320.00	3400.00
Lead	ND	0.90	ND	3.00
Silver	ND	ND	ND	0.11
Selenium	ND	2.40	1.60	ND

ND - Not Detected

* - Milligrams per Liter

General Die Casting Preliminary Sampling Data (TCLP)

Table 3

	SG9 mg/l*	SG10 mg/l	SG11 mg/l
Mercury	ND	ND	ND
Arsenic	ND	ND	0.10
Barium	ND	ND	2.20
Cadmium	0.09	ND	0.05
Chromium	0.20	0.30	0.10
Lead	2.00	0.20	0.50
Silver	ND	0.03	0.05
Selenium	ND	0.70	ND

ND - Not Detected

* - Milligrams per Liter

5.0 DISCUSSION OF POTENTIAL THREATS

Paragraph (b)(2) of 40 CFR 300.415 lists factors to be considered when determining the appropriateness of a potential removal action at a site. The following discussion presents a summary of those factors which are applicable to the General Die Casting site:

- (i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;

Hazardous materials have been identified throughout the General Die Casting facility. The building is secured but access to the inside can be gained by humans or animals if desired. The area in which the facility is located has a history of vandalism and unauthorized use of abandoned buildings as living quarters. Once inside the facility, an unfamiliar person would be likely to come into close contact with the hazardous materials present.

Parties responsible for the facility have allowed unprotected activities to proceed when poor air quality was documented by the TAT. The parties have also allowed a major water release to proceed for approximately three days without investigation. The MDNR has also reported that responsible parties have withheld information regarding contaminated soils at the site. All of these events demonstrate an inability or unwillingness of the parties to protect the general public from the hazards associated with the abandoned facility.

A spill of the approximately 900 gallons of corrosive, hazardous liquids identified on site into the reactive, cyanide bearing sludge located in the containment areas below could cause the formation of toxic hydrogen cyanide gas. A cloud of this gas would not be contained by the building. Unprotected humans and animals in and around the facility could likely be exposed to the cloud.

- (iii) Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release;

As noted in Section 3.0 over 2000 gallons of potentially hazardous solutions are stored on the General Die Casting site. Approximately 900 gallons have been proven corrosive. As previously mentioned, vandalism at the facility is very possible. The integrity of the tanks in the facility would easily be compromised by vandals and aging.

The responsible parties have not demonstrated an ability to monitor, prevent, or contain the contents of the tanks if released. The damaged diking, cracked walls, and cement floor would do little to contain such a spill. The fact that the U. S. EPA had to inform the responsible parties of a water main leak at the facility shows that such an event could occur and be uncontrolled for a significant period of time.

6.0 SUMMARY

Site assessment and sampling activities identified unsecured, hazardous materials at the General Die Casting site. These hazardous materials present a threat to human health and the environment as outlined in 40 CFR 300.415 paragraph (b)(2) sections i and iii.

APPENDIX A
SITE SAMPLING PLAN

S A M P L I N G P L A N

PURPOSE

This plan will outline the gathering of samples from the General Die Casting facility on Mt. Elliot Rd. in Detroit, Wayne County, Michigan. The analytical results from the samples will be used to determine if liquids and solids found in tanks, containment areas, and soils at the site pose an imminent threat to the public and environment. If imminent threat is found it will be used to justify a removal action as outlined in 40 Code of Federal Regulations (CFR) 300.415.

The samples will be analyzed to determine if they are hazardous based on 40 CFR 261. Initially Corrosivity, Reactivity, and Heavy Metal content will be determined. If heavy metal content in solid samples is found selected samples will be analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) for metals to determine if they should be considered hazardous waste.

TANKS

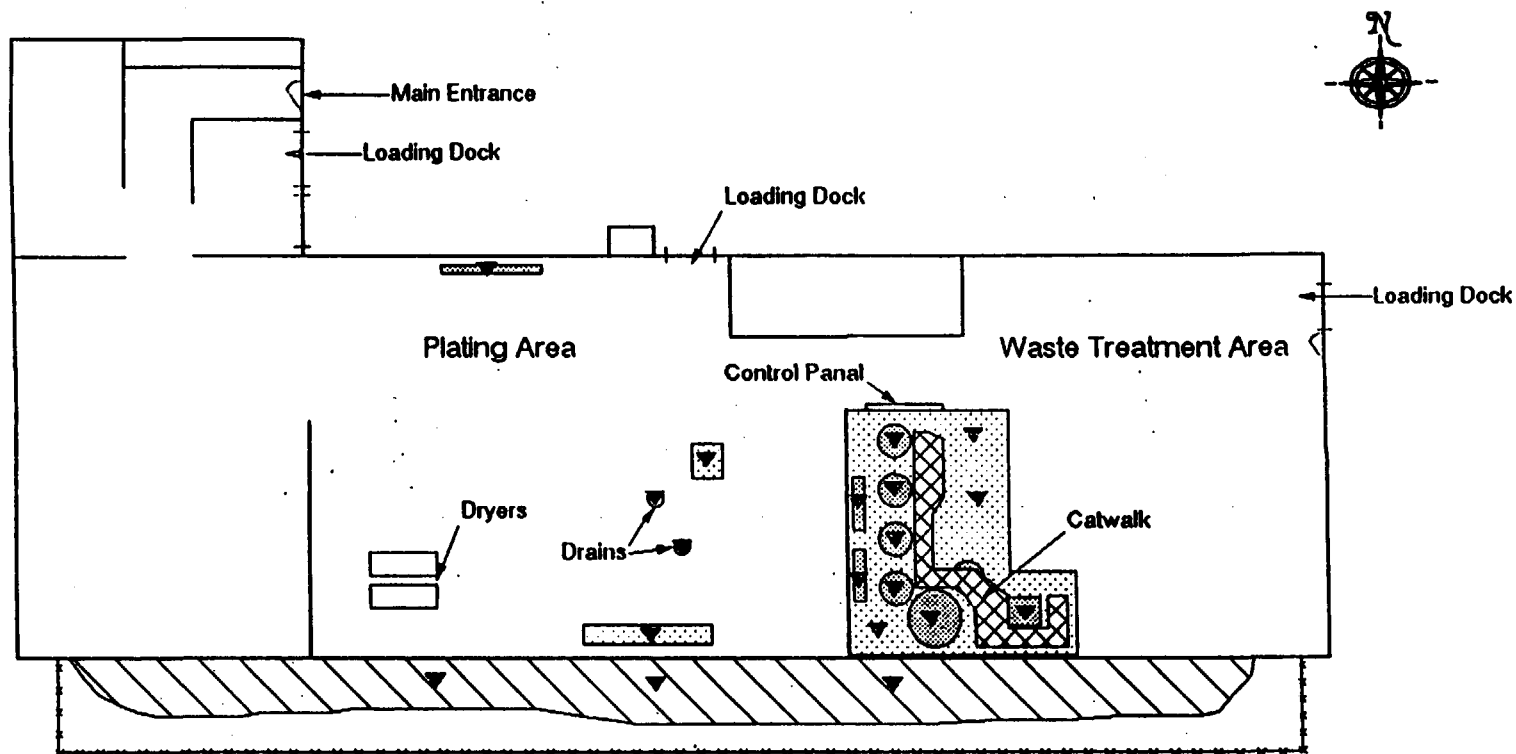
All liquid and solid materials located in tanks will be sampled. This will be done to both identify the material contents and to determine if they are hazardous. There are approximately fifteen tanks on the site. Liquid and solid samples will be analyzed for pH, total cyanide, and total Resource Conservation and Recovery Act (RCRA) metals including copper and zinc. This will allow the United States Environmental Protection Agency (U.S. EPA) to determine if tank contents are corrosive, reactive, and indicate if they may be characteristic based on RCRA.

CONTAINMENT AREAS

Samples of solid materials from within the three containment areas will be collected. A total of 3 samples should be collected from the waste treatment area tank containment. The containment areas are in poor condition and the possibility for migration from these materials being washed through cracks in the concrete slab and foundation exist. These samples will also be analyzed for pH, total cyanide, and total RCRA metals including copper and zinc.

EXCAVATION

The soils outside of the south wall were shown to contain cyanide, chromium, and other RCRA metals by sampling done by the PRP and MDNR in 1989. The PRP subsequently had the contaminated soils excavated and the excavation backfilled. To determine if the PRP effectively removed all contaminated soils, core samples will be collected from this area. The most likely area of soil contamination will be directly south of the old plating and waste treatment areas. A total of three core samples will be collected



LEGEND

- ▼ Sample Points (Suggested)
- Tanks
- Containment Areas
- Fencing
- Backfilled Excavation

SOURCE/DATE

E & E, Inc., January 30, 1992



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Technical Assistance Team
Region V

TITLE

Sampling Map

FIGURE #

1

SITE

General Die Casting

SCALE

None

CITY

Detroit

STATE

Michigan

TDD #

Sample Analysis

	Total Cyanide	Total Metals	pH
Tank Liquid	10	10	10
Tank Solid	10	10	10
Containment/drains	7	7	7
Soils	5	5	5

TCLP analysis will be performed on about 20% of retained samples.

SAMPLE PLAN

SITE NAME: General Die Cast TDD #: TC59201-036

SAMPLERS: W. Carter, P. Robinson PROJECT CODE: _____

LAB: CLAYTON Environmental SAMPLE #s: SL-1-32

DATE OF SAMPLING: _____

DATE SHIPPED: _____

TYPE OF LAB: _____ CRL _____ CLP X COMMERCIAL

GUARANTEED TURNAROUND TIME: 5 day Verbal 2 week hard

MATRIX

NO. OF SAMPLES

Soil/Sediment

- 3, 7

Sludge

10

Drum/Tanks

10

Wipes

Liquids

Air

Other: _____

PURPOSE OF SAMPLING:

- ☒ Site Characterization
- ☒ Extent of Contamination
- ☒ Confirm Presence of Suspected Contaminant
- ☐ Disposal/Treatment of Materials
- ☐ Confirm Efficiency of Existing Treatment Systems
- ☐ Other: _____

ATTACHMENTS:

- ☒ Map of Sample Locations
- ☐ Chain-of-Custody
- ☐ Field Data Sheets
- ☐ Drum Logs
- ☐ Calibration Sheets
- ☐ Other: _____

PLAN REVIEWED BY: _____

SAMPLING METHODS:

Sediment - Stainless trowels

Sledge - "

Soil - Bucket Auger (S.S.)

Liquids - Dip using sample container

DECON PROCEDURE:

- Alkanox - Wash

- Triple Rinse - DI water

DISPOSAL OF RINSEATE AND DECON MATERIALS:

- LEFT ON SITE

DISPOSAL OF SAMPLES:

By: LAB

ADDITIONAL MATERIALS REQUIRED AND LOADED IN RESPONSE VEHICLE:

CAI Monitor, Lighter, compass, water, PPE

LIQUID SAMPLES

No. of Surface Samples 10

No. of Well Samples _____

No. of Duplicates 1

No. of Blanks _____

ANALYSIS	NO. OF SAMPLES INCL. DUPES & BLANKS	NO. OF CONTAINERS PER SAMPLE	TOTAL NO. OF CONTAINER	PRESERVATION REQUIRED
Extractables				
(Low)	_____	x 2 =	80 oz. amber	ic
(Medium)	_____	x 8 =	16 oz. glass	_____
Volatiles	_____	x 2 =	40 ml. glass	ic
(Low Only)	_____			
All High Hazard Organics	_____	x 1 =	120 ml. glass	
Dioxin	_____	x 2 =	80 oz. amber	ic
(Low)	_____			
Metals				
(Low)	_____	x 1 =	1 liter HDPE	✓ 5 m
(Medium)	<u>11</u>	x 1 =	16 oz. glass	HNO
Cyanide				
(Low)	_____	x 1 =	1 liter HDPE	✓ 5 m
(Medium)	<u>11</u>	x 1 =	16 oz. glass	NaCl
All High Hazard Inorganics	_____	x 1 =	120 ml. glass	
Compatibility	_____	x 1 =	8 oz. glass	
Disposal	_____	x 1 =	16 oz. glass	
_____	_____	x _____ =	_____	_____

TOTAL NO. OF CONTAINERS REQUIRED FOR LIQUID SAMPLES:

_____ 40 ml. glass
 _____ 8 oz. glass
11 _____ 16 oz. glass *or 30 ml. for 16 oz. / 2 CN*
 _____ 1 l. HDPE
 _____ 80 oz. amber

SOIL/SEDIMENTS/SLUDGES.

No. of Surface Samples 5 No. of Composites
 No. of Depth Samples 3 No. of Grabs 10
 No. of Duplicates 2

ANALYSIS	NO. OF SAMPLES INCL. DUPS & BLANKS	NO. OF CONTAINERS PER SAMPLE	TOTAL NO. OF CONTAINER
Extractables (Low/Med)	<u> </u>	x 1	<u> </u> 8 oz. glass
Volatiles (Low Only)	<u> </u>	x 2	<u> </u> 120 ml. gla
All High Hazard Organics	<u> </u>	x 1	<u> </u> 120 ml. gla
Dioxin	<u> </u>	x 1	<u> </u> 4 oz. glass
Metals (Low/Med)	<u>24</u>	x 1	<u>24</u> 8 oz. glass
Cyanide (Low)	<u>24</u>	x 1	<u>24</u> 8 oz. glass
Cyanide (Med)			
METAL SAMPLE SUFFICES			
All High Hazard Inorganics	<u> </u>	x 1	<u> </u> 120 ml. glas
Compatibility	<u> </u>	x 1	<u> </u> 8 oz. glass
Disposal	<u> </u>	x 1	<u> </u> 16 oz. glass

TOTAL NO. OF CONTAINERS REQUIRED FOR SOILS/SEDIMENTS/SLUDGES:

24 8 oz. glass *or same for CN & Metals*
 120 ml. glass
 4 oz. glass
 16 oz. glass

ICE REQUIRED AS PRESERVATIVE: YES X NO

DRUMS/TANKS

see liquids

No. of Grabs _____

No. of Composites _____

No. of Duplicates _____

MAJORITY OF DRUM AND TANK SAMPLES WILL BE CONSIDERED HIGH HAZARD AND SHOULD BE COLLECTED AS FOLLOWS:

<u>ANALYSIS</u>	<u>NO. OF SAMPLES INCL. DUPES & BLANKS</u>	<u>NO. OF CONTAINERS PER SAMPLE</u>	<u>TOTAL NO. OF CONTAINERS</u>
Organics	_____	x 1	_____ 120 ml. gla
Metals & Cyanide	_____	x 1	_____ 120 ml. gla
Compatibility	_____	x 1	_____ 8 oz. glass
Disposal	_____	x 1	_____ 16 oz. glas

TOTAL NO. OF CONTAINERS REQUIRED:

_____ 120 ml. glass

_____ 8 oz. glass

_____ 16 oz. glass

WIPE SAMPLES

NO. OF
WIPE SAMPLES

NO. OF
BLANKS

TOTAL NO. OF
CONTAINERS

_____ + _____ = _____ 4 oz. glass

WETTING AGENT:

- [] Hexane
[] Water
[] Other _____

AIR SAMPLES

COMPOUNDS OR ELEMENTS SAMPLING FOR: _____

- [] High Volume Sampling
[] Low Volume Sampling
_____ Gillians
_____ Other
- [] Strip Chart
_____ OVA
_____ HNU
_____ Other
[] Other _____

COLLECTION MEDIA:

- [] Tube
_____ Collection
_____ Colorimetric
- [] Filter
_____ Cassette
_____ Hi-Vol
_____ Type
_____ Pore Size
[] Other _____

NO. OF SAMPLE
STATIONS

NO. OF
BLANKS

TOTAL

COLLECTION MEDIA
REQUIRED

_____	+	_____	=	_____	_____
_____	+	_____	=	_____	_____
_____	+	_____	=	_____	_____
_____	+	_____	=	_____	_____

COLLECTION MEDIA IN SERIES: _____ YES _____ NO

CALIBRATION METHOD (ATTACH CALIBRATION SHEETS): _____

APPENDIX B
QUALITY ASSURANCE REVIEW



ecology and environment. inc.

6777 ENGLE ROAD CLEVELAND OHIO 44130 TEL. (216) 243-3330

International Specialists in the Environment

M E M O R A N D U M

DATE: March 11, 1992
TO: Herb Langer, Project Manager, E & E, Detroit, MI
FROM: Emily S. Landis, TAT-Geochemist, E & E, Cleveland, OH *see*
THRU: George M. Albertson, TAT-Chemist, E & E, Cleveland, OH *Anna*
SUBJ: RCRA Metals Data Quality Assurance Review, General Die Casting Site, Wayne County, MI.

REF: Analytical TDD: T05-9202-802 Project TDD: T05-9201-036
Analytical PAN: EMI1286AAA Project PAN: EMI1286SAA

The data quality assurance review of 8 sludge samples and 6 liquid samples taken from the General Die Casting site on February 10, 1992 is now complete. RCRA metals analyses (EPA Methods 6010 and 7470) were performed by Clayton Environmental Consultants, Novi, Michigan. Note that SG-1/MS, SG-1/MSD, SG-6/MS, SG-6/MSD were analyzed as unspiked samples.

Samples numbered SG-1 through SG-5, including SG-1/MS and SG-1/MSD, and excluding SG-3, correspond, respectively, to the laboratory's numbers 950265 through 950271. Samples SG-3, SG-6 through SG-11 (including SG-6/MS and SG-6/MSD) correspond, respectively, to the laboratory's numbers 950272 through 950280.

Data Qualifications:

I Holding Time: Acceptable.

The samples were received by the laboratory on February 11, 1992 and analyzed February 14-19, 1992, well within the 6-month holding time for metals and 28-day holding time for mercury.

II Initial & Continuing Calibrations: Acceptable.

A blank and 3-4 standards were run for each element prior to sample

analysis on the inductively coupled plasma (ICP) instrument. The blank and a standard were run as continuing calibration checks before and after the samples. For the cold vapor (CV - mercury) analysis, a blank and 4 standards were run for the initial calibration. Samples for both methods fell within the calibration ranges.

III ICP Interference Check Standards: Acceptable.

The interference check standards for the ICP method were within the accepted range of 80-120 percent recovery (%R).

IV Method Blanks: Acceptable.

Method blanks were run for both ICP and CV methods. In each, the analytes were all below the instrument detection limit (IDL).

VII Matrix Spikes/Spike Duplicates: Acceptable.

In addition to being run as regular samples, SG-1/MS, SG-1/MSD, SG-6/MS, and SG-6/MSD were spiked by the laboratory. Recoveries were within the acceptable range of 80-120%, except for mercury on samples SG-1/MS and SG-1/MSD, for which the spiked sample was out of calibration range. No action is required for matrix spike data alone.

Overall Assessment of Data for Use:

The overall usefulness of the data is based on the criteria outlined in "Quality Assurance/Quality Control Guidance for Removal Activities, Data Validation Procedures" (April 1990). With the information provided, the data are acceptable for use as reported.

CLAYTON ENVIRONMENTAL CONSULTANTS, INC.
22345 Roethel Drive Novi, Michigan 48375

Ms. Emily S. Landis
TAT Member
ECOLOGY & ENVIRONMENT, INC.
6777 North Engle Road
Cleveland, OH 44130

Date Reported: 3-MAR-92
Date Received: 11-FEB-92
Clayton Project No. 78380-17
PARTIAL REPORT

Dear Ms. Landis:

The following is our partial report on the samples submitted for analysis. As requested, your quality control data has been enclosed.

Table 1

Lab Number: 950265
Sample Description: SG1

Analyte	Analytical Method (EPA)	Analytical Results (mg/kg)	Limit of Detection (mg/kg)
Arsenic	6010	20	5
Barium	6010	30	5
Cadmium	6010	30	3
Chromium	6010	110	5
Lead	6010	170	5
Mercury	7471	0.44	0.05
Selenium	6010	50	5
Silver	6010	3	1

ECOLOGY & ENVIRONMENT, INC.
Clayton Project No. 78380-17

Table 2

Lab Number: 950267
Sample Description: SG1/MS

Analyte	Analytical Method (EPA)	Analytical Results (mg/kg)	Limit of Detection (mg/kg)
Arsenic	6010	20	5
Barium	6010	20	5
Cadmium	6010	30	3
Chromium	6010	120	5
Lead	6010	170	5
Mercury	7471	0.59	0.05
Selenium	6010	60	5
Silver	6010	<1	1

Table 3

Lab Number: 950268
Sample Description: SG1/MSD

Analyte	Analytical Method (EPA)	Analytical Results (mg/kg)	Limit of Detection (mg/kg)
Arsenic	6010	20	5
Barium	6010	30	5
Cadmium	6010	30	3
Chromium	6010	140	5
Lead	6010	170	5
Mercury	7471	0.65	0.05
Selenium	6010	60	5
Silver	6010	2	1

Table 4

Lab Number: 950269
Sample Description: SG2

Analyte	Analytical Method (EPA)	Analytical Results (mg/kg)	Limit of Detection (mg/kg)
Arsenic	6010	<5	5
Barium	6010	20	5
Cadmium	6010	4	3
Chromium	6010	70	5
Lead	6010	30	5
Mercury	7471	0.06	0.05
Selenium	6010	30	5
Silver	6010	<1	1

Table 5

Lab Number: 950270
Sample Description: SG4

Analyte	Analytical Method (EPA)	Analytical Results (mg/kg)	Limit of Detection (mg/kg)
Arsenic	6010	9	5
Barium	6010	<5	5
Cadmium	6010	3	3
Chromium	6010	<5	5
Lead	6010	20	5
Mercury	7471	<0.05	0.05
Selenium	6010	7	5
Silver	6010	10	1

Table 6

Lab Number: 950271
Sample Description: SG5

Analyte	Analytical Method (EPA)	Analytical Results (mg/kg)	Limit of Detection (mg/kg)
Arsenic	6010	<5	5
Barium	6010	<5	5
Cadmium	6010	<3	3
Chromium	6010	<5	5
Lead	6010	10	5
Mercury	7471	0.06	0.05
Selenium	6010	<5	5
Silver	6010	5	1

Table 7

Sample Description: LAB BLANK

Analyte	Analytical Method (EPA)	Analytical Results (mg/kg)	Limit of Detection (mg/kg)
Arsenic	6010	<5	5
Barium	6010	<5	5
Cadmium	6010	<3	3
Chromium	6010	<5	5
Lead	6010	<5	5
Mercury	7471	<0.05	0.05
Selenium	6010	<5	5
Silver	6010	<1	1

ECOLOGY & ENVIRONMENT, INC.
Clayton Project No. 78380-17

Table 8

Lab Number: 950272
Sample Description: SG3

Analyte	Analytical Method (EPA)	Analytical Results (mg/L)	Limit of Detection (mg/L)
Arsenic	6010	0.3	0.1
Barium	6010	0.2	0.1
Cadmium	6010	0.10	0.05
Chromium	6010	4.2	0.1
Lead	6010	<0.1	0.1
Mercury	7470	<0.01	0.01
Selenium	6010	<0.1	0.1
Silver	6010	<0.02	0.02

Table 9

Lab Number: 950273
Sample Description: SG6

Analyte	Analytical Method (EPA)	Analytical Results (mg/L)	Limit of Detection (mg/L)
Arsenic	6010	<0.1	0.1
Barium	6010	0.1	0.1
Cadmium	6010	<0.05	0.05
Chromium	6010	<0.1	0.1
Lead	6010	0.9	0.1
Mercury	7470	<0.01	0.01
Selenium	6010	2.4	0.1
Silver	6010	<0.02	0.02

Table 10

Lab Number: 950274
Sample Description: SG6/MS

Analyte	Analytical Method (EPA)	Analytical Results (mg/L)	Limit of Detection (mg/L)
Arsenic	6010	<0.1	0.1
Barium	6010	0.1	0.1
Cadmium	6010	<0.05	0.05
Chromium	6010	<0.1	0.1
Lead	6010	1.0	0.1
Mercury	7470	<0.01	0.01
Selenium	6010	2.3	0.1
Silver	6010	<0.02	0.02

Table 11

Lab Number: 950275
Sample Description: SG6/MSD

Analyte	Analytical Method (EPA)	Analytical Results (mg/L)	Limit of Detection (mg/L)
Arsenic	6010	<0.1	0.1
Barium	6010	<0.1	0.1
Cadmium	6010	<0.05	0.05
Chromium	6010	0.1	0.1
Lead	6010	<0.1	0.1
Mercury	7470	<0.01	0.01
Selenium	6010	1.7	0.1
Silver	6010	<0.02	0.02

ECOLOGY & ENVIRONMENT, INC.
Clayton Project No. 78380-17

Table 12

Lab Number: 950276
Sample Description: SG7

Analyte	Analytical Method (EPA)	Analytical Results (mg/L)	Limit of Detection (mg/L)
Arsenic	6010	<0.1	0.1
Barium	6010	<0.1	0.1
Cadmium	6010	<0.05	0.05
Chromium	6010	320	0.1
Lead	6010	<0.1	0.1
Mercury	7470	0.02	0.01
Selenium	6010	1.6	0.1
Silver	6010	<0.02	0.02

Table 13

Lab Number: 950277
Sample Description: SG8

Analyte	Analytical Method (EPA)	Analytical Results (mg/L)	Limit of Detection (mg/L)
Arsenic	6010	2.1	0.1
Barium	6010	<0.1	0.1
Cadmium	6010	0.26	0.05
Chromium	6010	3,400	0.1
Lead	6010	3.0	0.1
Mercury	7470	<0.01	0.01
Selenium	6010	<0.1	0.1
Silver	6010	0.11	0.02

Table 14

Sample Description: LAB BLANK

Analyte	Analytical Method (EPA)	Analytical Results (mg/L)	Limit of Detection (mg/L)
Arsenic	6010	<0.1	0.1
Barium	6010	<0.1	0.1
Cadmium	6010	<0.05	0.05
Chromium	6010	<0.1	0.1
Lead	6010	<0.1	0.1
Mercury	7470	<0.01	0.01
Selenium	6010	<0.1	0.1
Silver	6010	<0.02	0.02

Table 15

Lab Number: 950278
Sample Description: SG9

Analyte	Analytical Method (EPA)	Analytical Results (mg/kg)	Limit of Detection (mg/kg)
Arsenic	6010	10	5
Barium	6010	150	5
Cadmium	6010	10	3
Chromium	6010	650	5
Lead	6010	550	5
Mercury	7471	0.45	0.05
Selenium	6010	30	5
Silver	6010	9	1

Table 16

Lab Number: 950279
Sample Description: SG10

Analyte	Analytical Method (EPA)	Analytical Results (mg/kg)	Limit of Detection (mg/kg)
Arsenic	6010	12	5
Barium	6010	36	5
Cadmium	6010	13	3
Chromium	6010	1,800	5
Lead	6010	220	5
Mercury	7471	2.1	0.05
Selenium	6010	100	5
Silver	6010	2	1

Table 17

Lab Number: 950280
Sample Description: SG11

Analyte	Analytical Method (EPA)	Analytical Results (mg/kg)	Limit of Detection (mg/kg)
Arsenic	6010	51	5
Barium	6010	190	5
Cadmium	6010	40	3
Chromium	6010	4,100	5
Lead	6010	810	5
Mercury	7471	1.6	0.05
Selenium	6010	240	5
Silver	6010	2	1

Table 23

Lab Number: 950267 MATRIX SPIKE
Sample Description: SG1/MS

Analyte	Spike Level (mg/kg)	Recovery (%)
Arsenic	100	87
Barium	100	63
Cadmium	100	90
Chromium	100	80
Lead	100	82
Mercury	0.1	*
Selenium	100	82
Silver	100	107

* Matrix spike recovery could not be determined due to high level of mercury present in sample.

Table 24

Lab Number: 950268 MATRIX SPIKE DUPLICATE
Sample Description: SG1/MSD

Analyte	Spike Level (mg/kg)	Recovery (%)
Arsenic	100	89
Barium	100	62
Cadmium	100	94
Chromium	100	120
Lead	100	98
Mercury	0.1	*
Selenium	100	85
Silver	100	108

* Matrix spike recovery could not be determined due to high level of mercury present in sample.

Table 25

Lab Number: 950274 MATRIX SPIKE
Sample Description: SG6/MS

Analyte	Spike Level (mg/L)	Recovery (%)
Arsenic	4	91
Barium	4	93
Cadmium	4	87
Chromium	4	84
Lead	4	92
Mercury	0.02	96
Selenium	4	97
Silver	4	105

Table 26

Lab Number: 950275 MATRIX SPIKE DUPLICATE
Sample Description: SG6/MSD

Analyte	Spike Level (mg/L)	Recovery (%)
Arsenic	4	93
Barium	4	80
Cadmium	4	88
Chromium	4	87
Lead	4	87
Mercury	0.02	88
Selenium	4	92
Silver	4	107

ECOLOGY & ENVIRONMENT, INC.
Clayton Project No. 78380-17

Lab Number	Sample Description	Total Cyanide (mg/kg)
950265	SG1	4.02
950267	SG1/MS	0.101
950268	SG1/MSD	0.102
950269	SG2	13.2
950270	SG4	<0.638 *
950271	SG5	<0.770 *

Limit of Detection: 0.125 mg/kg
Analytical Method (EPA): 9012

* Limit of detection raised due to percent moisture.



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M E M O R A N D U M

DATE: March 13, 1992
TO: Herb Langer, Project Manager, E & E, Detroit, MI
FROM: Emily S. Landis, TAT-Geochemist, E & E, Cleveland, OH *see*
THRU: George M. Albertson, TAT-Chemist, E & E, Cleveland, OH *Yima*
SUBJ: Total Cyanide Data Quality Assurance Review, General Die
Casting Site, Wayne County, MI.

REF: Analytical TDD: T05-9202-802 Project TDD: T05-9201-036
Analytical PAN: EMI1286AAA Project PAN: EMI1286SAA

The data quality assurance review of 15 samples collected at the General Die Casting site on February 10, 1992, is now complete. The samples were analyzed by EPA Method 9012 or 335.3, depending upon their matrix, by Keystone Laboratory, Monroe, Pennsylvania.

The samples SG-1 (including SG-1/MS and SG-1/MSD but excluding SG-3) correspond, respectively, to the laboratory's numbers 950265-950271. Sample SG-3 was assigned the laboratory number 950272; SG-8 through SG-11 are numbered 950278-950280.

Overall Assessment of Data for Use:

Guidelines for the evaluation of cyanide analyses are not outlined in "Quality Assurance/Quality Control Guidance for Removal Activities, Data Validation Procedures" (April 1990). However, QC guidelines are listed in SW-846, EPA Method 9012. No method data was submitted with the data package, therefore, the results cannot be properly evaluated.

ECOLOGY & ENVIRONMENT, INC.
Clayton Project No. 78380-17

Lab Number	Sample Description	Total Cyanide (mg/L)
950272	SG3	<0.010
950273	SG6	<0.010
950274	SG6/MS	*
950275	SG6/MSD	*
950276	SG7	<0.010
950277	SG8	<0.010

Limit of Detection: 0.010 mg/L
Analytical Method (EPA): 335.3

* Unable to quantitate due to matrix interference.

III ICP Interference Check Standard: Acceptable.

ICP control limits were met for all elements (excluding mercury, which is analyzed by CV technique).

IV Blanks: Acceptable.

Method blanks were run for both ICP and CV methods. In each, the analytes were all below the instrument detection limit (IDL).

Overall Assessment of Data for Use:

The overall usefulness of the data is based on the criteria outlined in "Quality Assurance/Quality Control Guidance for Removal Activities, Data Validation Procedures" (April 1990) and 40 CFR 261, Appendix II - Toxicity Characteristic Leaching Procedure. With the information provided, the data are considered acceptable for use.

Analytical Results
for
ECOLOGY & ENVIRONMENT, INC.

Clayton Project No. 78380-17

Sample Matrix: Sludge
Lab Number: 950278
Sample Identification: SG9

EPA HW Number	CAS Number	Constituent	Analytical Result (mg/L)	Regulatory Level (mg/L)
D004	7440-38-2	Arsenic	<0.1	5.0
D005	7440-39-3	Barium	<0.1	100.0
D006	7440-43-9	Cadmium	0.09	1.0
D007	7440-47-3	Chromium	0.2	5.0
D008	7439-92-1	Lead	2.0	5.0
D009	7439-97-6	Mercury	<0.01	0.2
D010	7782-49-2	Selenium	<0.1	1.0
D011	7440-22-4	Silver	<0.02	5.0

Extraction: 40 CFR 261, Appendix II--Toxicity Characteristic Leaching Procedure (TCLP).

Analysis: EPA Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. SW-846, Second and Third Editions.

Analytical Results
for
ECOLOGY & ENVIRONMENT, INC.

Clayton Project No. 78380-17

Sample Matrix: Sludge
Lab Number: 950279
Sample Identification: SG10

EPA HW Number	CAS Number	Constituent	Analytical Result (mg/L)	Regulatory Level (mg/L)
D004	7440-38-2	Arsenic	<0.1	5.0
D005	7440-39-3	Barium	<0.1	100.0
D006	7440-43-9	Cadmium	<0.05	1.0
D007	7440-47-3	Chromium	0.3	5.0
D008	7439-92-1	Lead	0.2	5.0
D009	7439-97-6	Mercury	<0.01	0.2
D010	7782-49-2	Selenium	0.7	1.0
D011	7440-22-4	Silver	0.03	5.0

Extraction: 40 CFR 261, Appendix II--Toxicity Characteristic Leaching Procedure (TCLP).

Analysis: EPA Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. SW-846, Second and Third Editions.

Analytical Results
for
ECOLOGY & ENVIRONMENT, INC.

Clayton Project No. 78380-17

Sample Matrix: Sludge
Lab Number: 950280
Sample Identification: SG11

EPA HW Number	CAS Number	Constituent	Analytical Result (mg/L)	Regulatory Level (mg/L)
D004	7440-38-2	Arsenic	0.1	5.0
D005	7440-39-3	Barium	2.2	100.0
D006	7440-43-9	Cadmium	0.05	1.0
D007	7440-47-3	Chromium	0.1	5.0
D008	7439-92-1	Lead	0.5	5.0
D009	7439-97-6	Mercury	<0.01	0.2
D010	7782-49-2	Selenium	<0.1	1.0
D011	7440-22-4	Silver	0.05	5.0

Extraction: 40 CFR 261, Appendix II--Toxicity Characteristic Leaching Procedure (TCLP).

Analysis: EPA Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, Second and Third Editions.

CHAIN OF CUSTODY RECORD

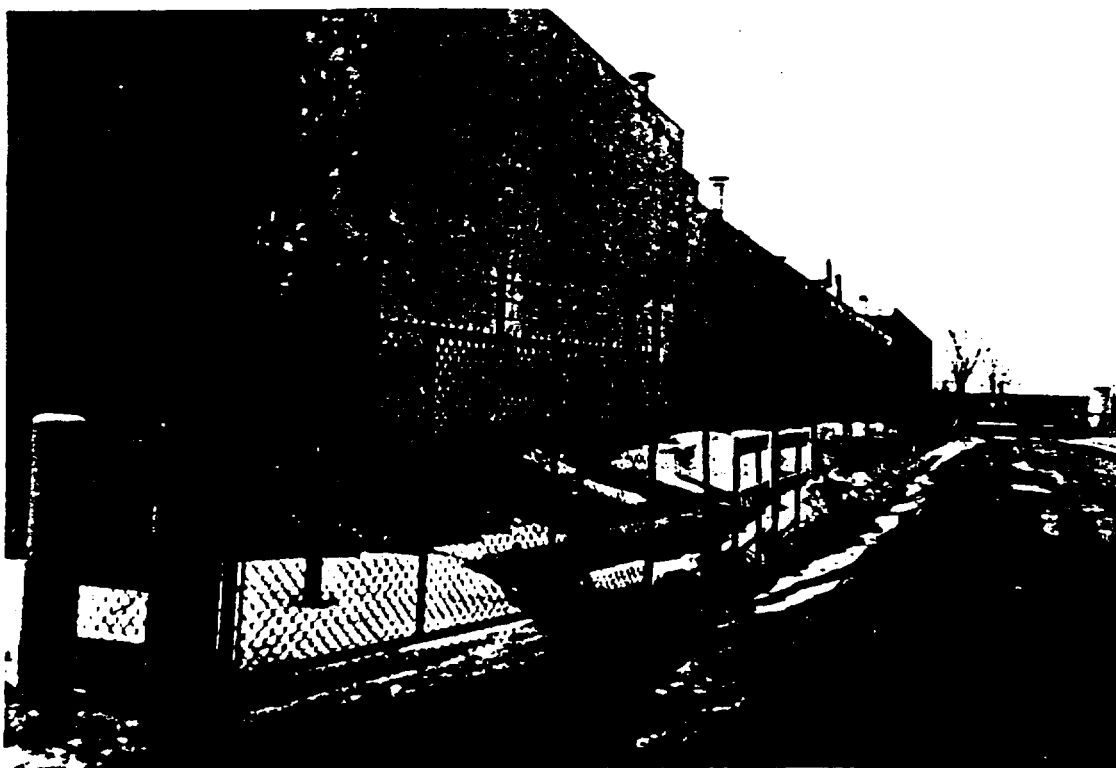
PROJ. NO.		PROJECT NAME				NO. OF CONTAINERS	TOTAL METALS				TOTAL CHLORIDE				REMARKS
SAMPLERS (Signature)															
STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION										
SG1	2/10	10:30		X	Nickel Treatment	1	X	X	X					Hold for possible TCLP	
MS	2/10	10:20		X	MATRIX SPIKE	1								MATRIX SPIKE	
MSD	2/10	10:30		X	MATRIX SPIKE Dup	1								MATRIX SPIKE Dup	
SG2	2/10	10:40		X	Filter Aid Tank	1	X	X	X					Hold for possible TCLP	
SG3	2/10	11:00		X	ADDITIVE (Treatment)	3	X	X	X						
SG4	2/10	11:15		X	ADDITIVE (Treatment)	1	X	X	X					Hold for possible TCLP	
SG5	2/10	11:45		X	CRYSTAL ON PIPES	1	X	X	X					Hold for possible TCLP	
SG6	2/10	12:00		X	DESTROIT TANK #1	2	X	X							
MS	2/10	12:00		X	MATRIX SPIKE	1								MATRIX SPIKE	
MSD	2/10	12:00		X	MATRIX SPIKE Dup	1								MATRIX SPIKE Dup	
SG7	2/10	12:15		X	DESTROIT TANK #2	2	X	X							
SG8	2/10	12:15		X	DESTROIT TANK #3	3	X	X							
SG9	2/10	13:30		X	Ni Treatment Sludge	1	X	X	X					Hold for possible TCLP	
SG10	2/10	13:45		X	Main Treatment Sludge	1	X	X	X					Hold for possible TCLP	
SG11	2/10	13:50		X	Scum Sludge	1	X	X	X					Hold for possible TCLP	
Relinquished by: (Signature)		Date / Time		Received by: (Signature)		Relinquished by: (Signature)		Date / Time		Received by: (Signature)					
Relinquished by: (Signature)		Date / Time		Received by: (Signature)		Relinquished by: (Signature)		Date / Time		Received by: (Signature)					
Relinquished by: (Signature)		Date / Time		Received for Laboratory by: (Signature)		Date / Time				Remarks					

CLAYTON ENVIRONMENTAL
22345 ROEHLER
NMI, MI 48065

APPENDIX C
ANNOTATED PHOTOGRAPHS



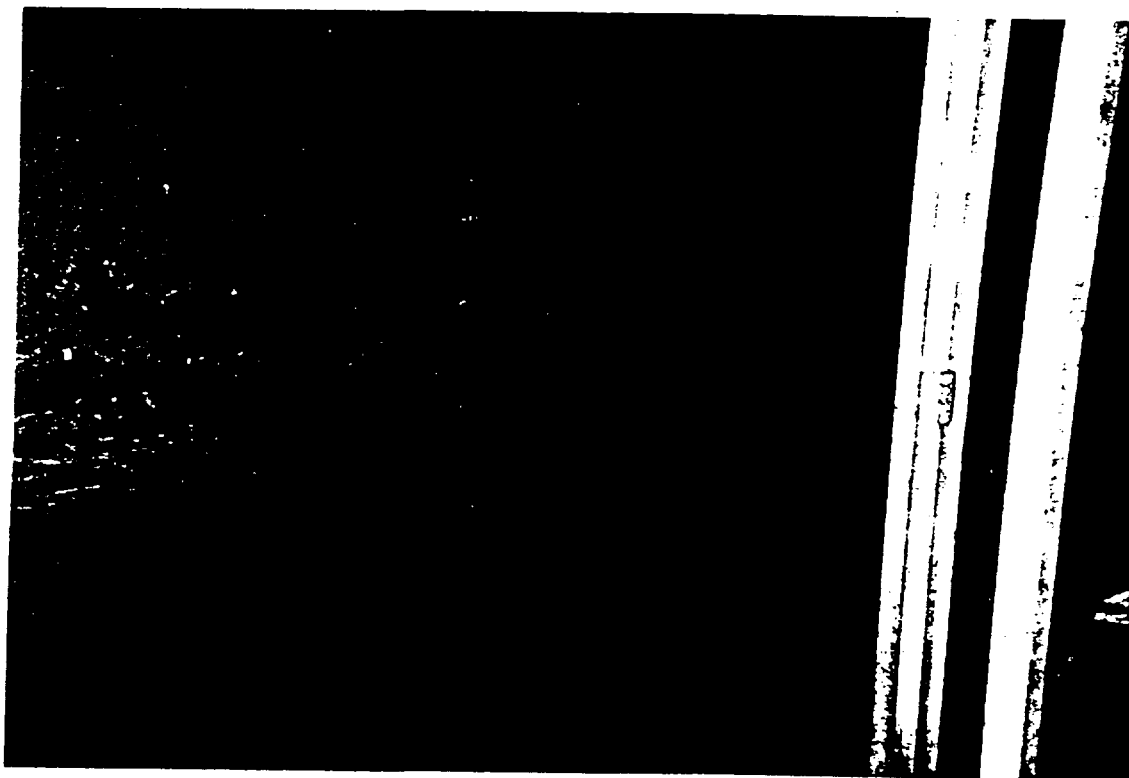
Site: General Die Casting
 Photo No: 01 Date: 1/28/92
 Direction: North
 Camera: OLYMPUS INFINITY 35mm
 Photographer: Wilde
 Subject: Front of facility.



Site: General Die Casting
 Photo No: 02 Date: 1/28/92
 Direction: East
 Camera: OLYMPUS INFINITY 35mm
 Photographer: Wilde
 Subject: Water rushing out of south
 side of building.



Site: General Die Casting
Photo No: 03 Date: 1/28/92
Direction: North
Camera: OLYMPUS INFINITY 35mm
Photographer: Wilde
Subject: Water as it exits building.



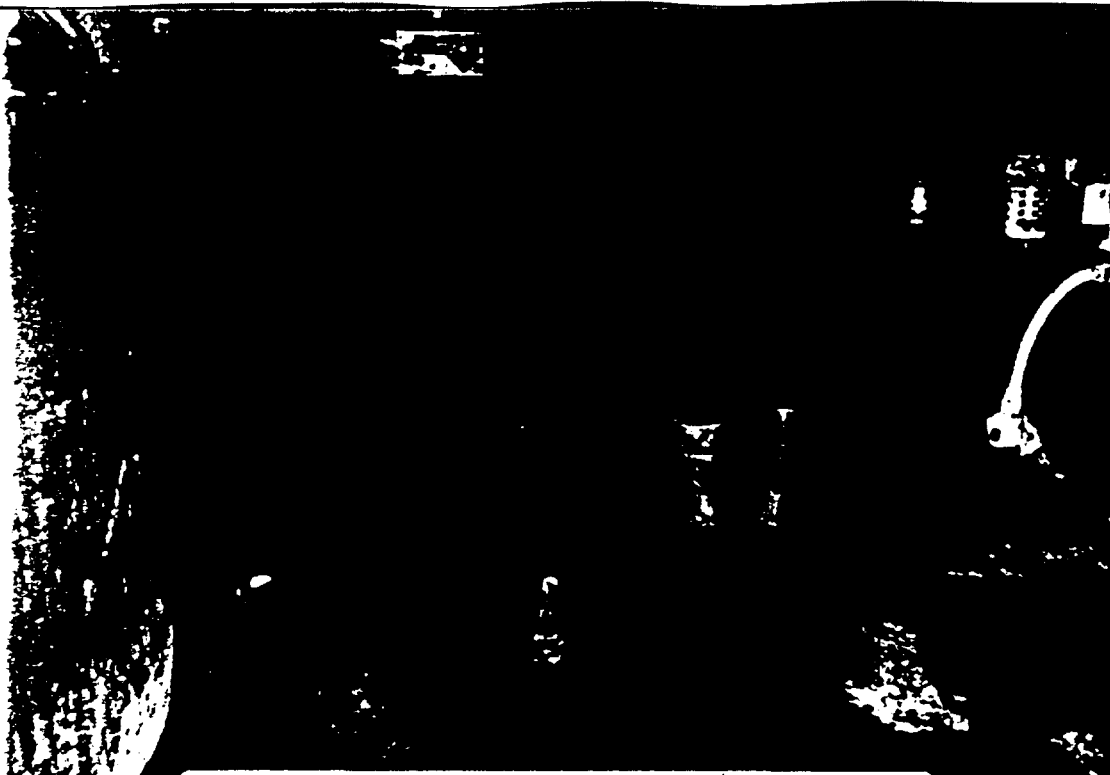
Site: General Die Casting
Photo No: 04 Date: 1/28/92
Direction: Southwest
Camera: OLYMPUS INFINITY 35mm
Photographer: Sirhan
Subject: Watermain rupture point.



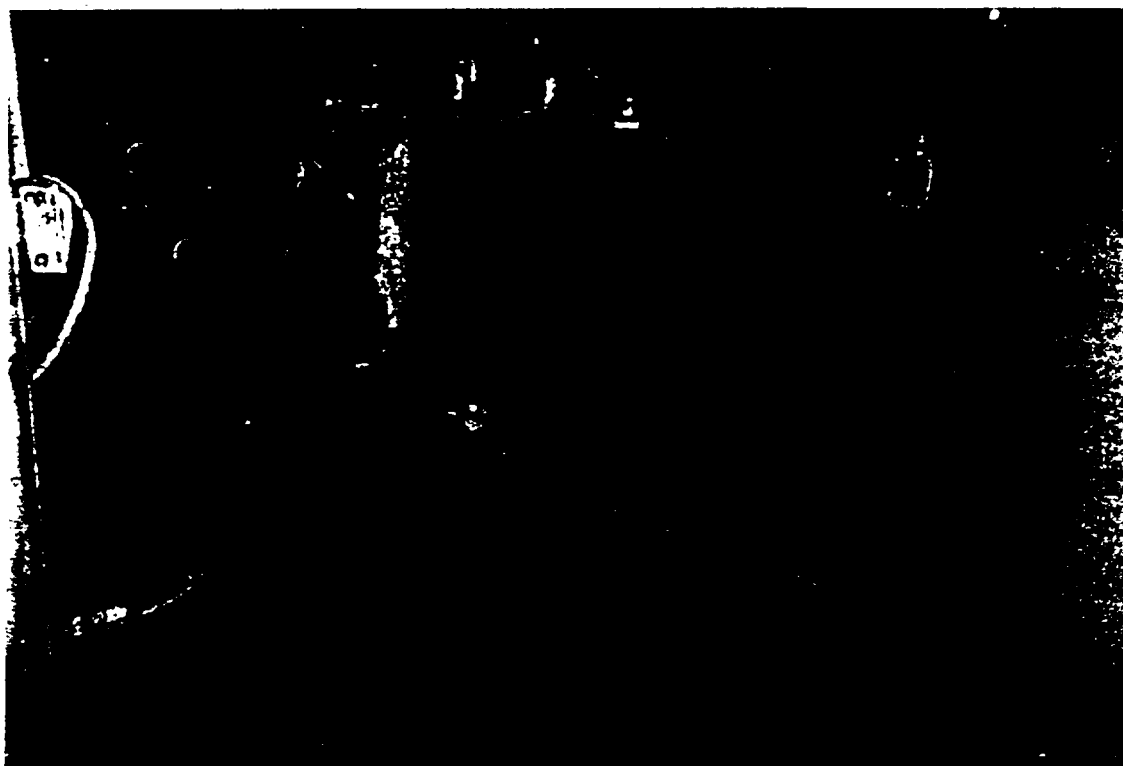
Site: General Die Casting
 Photo No: 05 Date: 1/28/92
 Direction: East
 Camera: OLYMPUS INFINITY 35mm
 Photographer: Guria
 Subject: Sludge on floor of waste
 treatment area.



Site: General Die Casting
 Photo No: 06 Date: 1/28/92
 Direction: East
 Camera: OLYMPUS INFINITY 35mm
 Photographer: Guria
 Subject: Corroded fiber drum in
 treatment area.



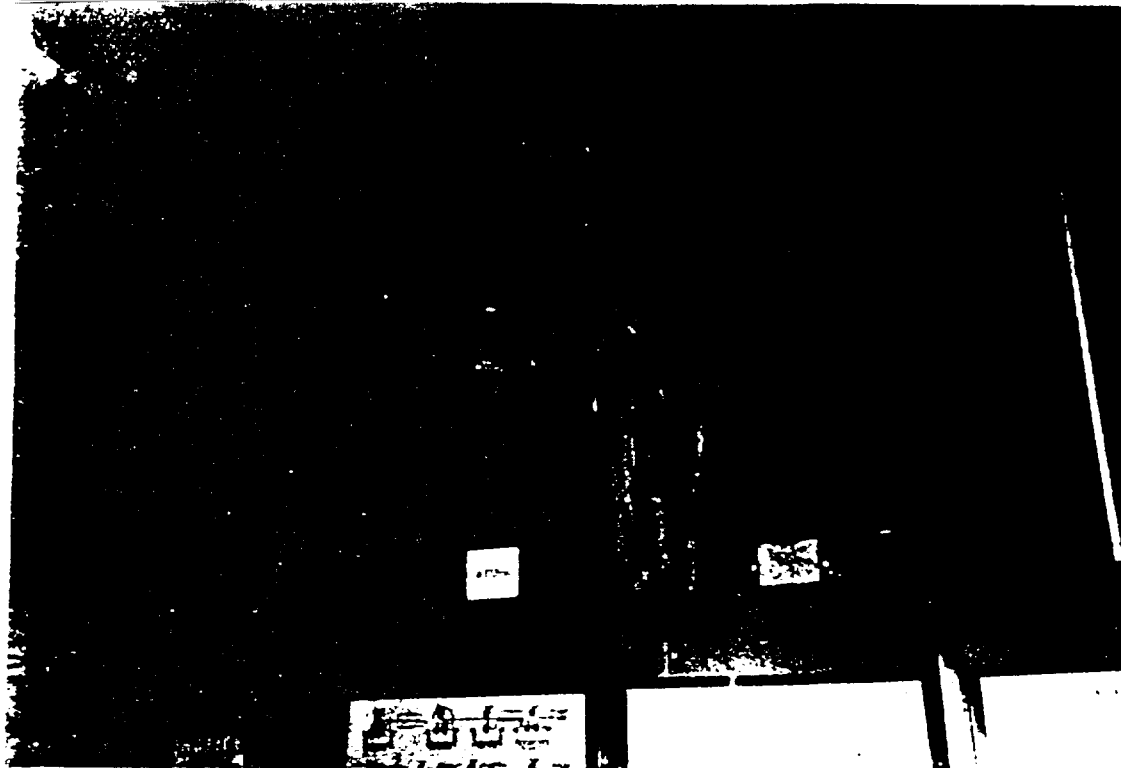
Site: General Die Casting
 Photo No: 07 Date: 1/28/92
 Direction: East
 Camera: OLYMPUS INFINITY 35mm
 Photographer: Langer
 Subject: OSC Guria inspects sodium
 bisulfide tank in treatment area.



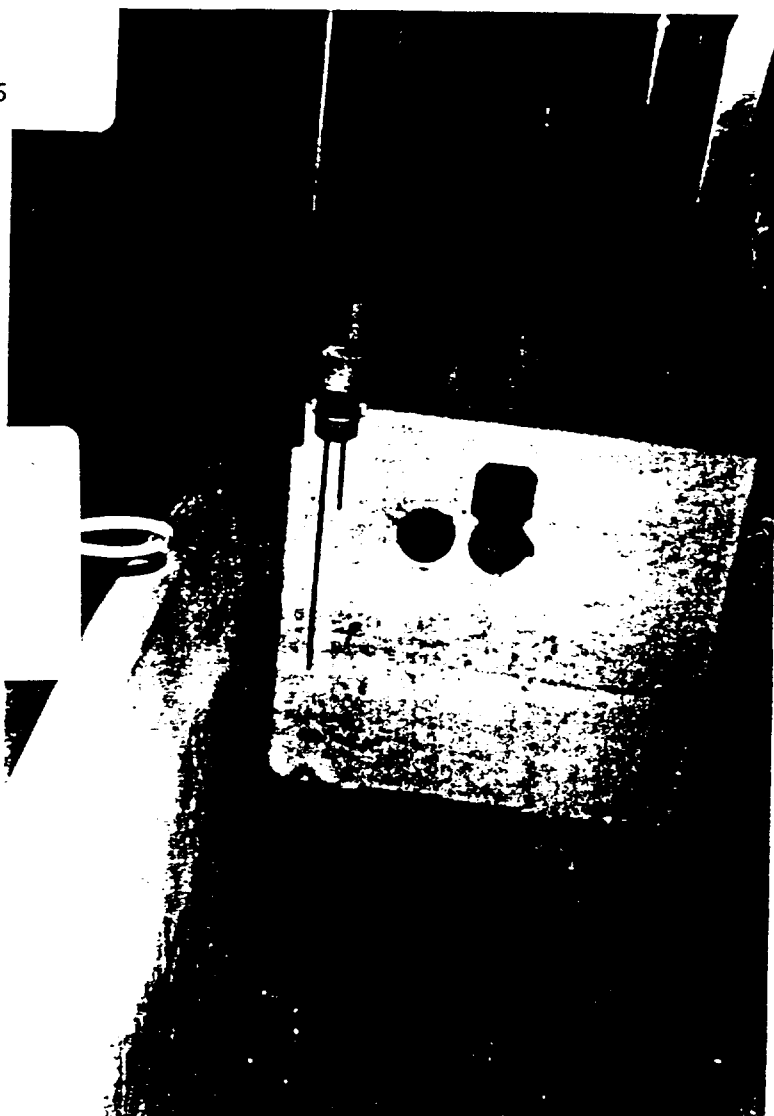
Site: General Die Casting
 Photo No: 08 Date: 1/28/92
 Direction: Southeast
 Camera: OLYMPUS INFINITY 35mm
 Photographer: Langer
 Subject: OSC Guria inspects crystal
 matter on pipe in treatment area.



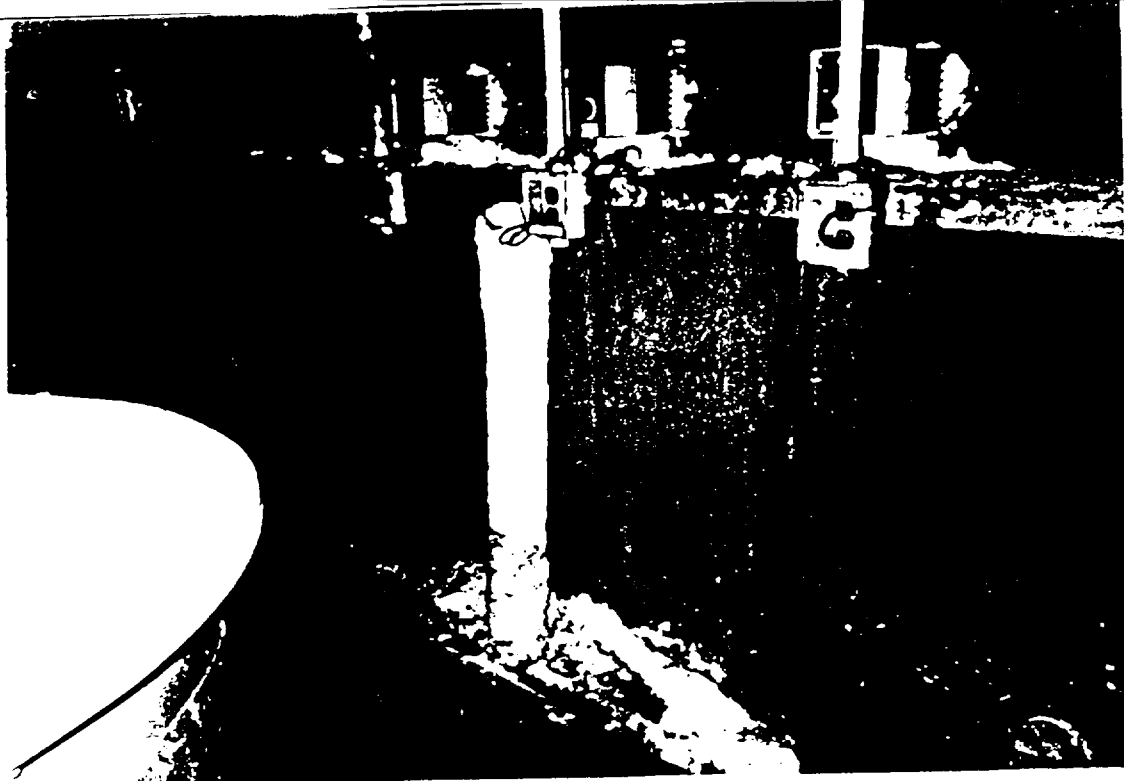
Site: General Die Casting
Photo No: 09 Date: 1/28/92
Direction: South
Camera: OLYMPUS INFINITY 35mm
Photographer: Langer
Subject: Tanks containing green
sludge in nickel treatment area.



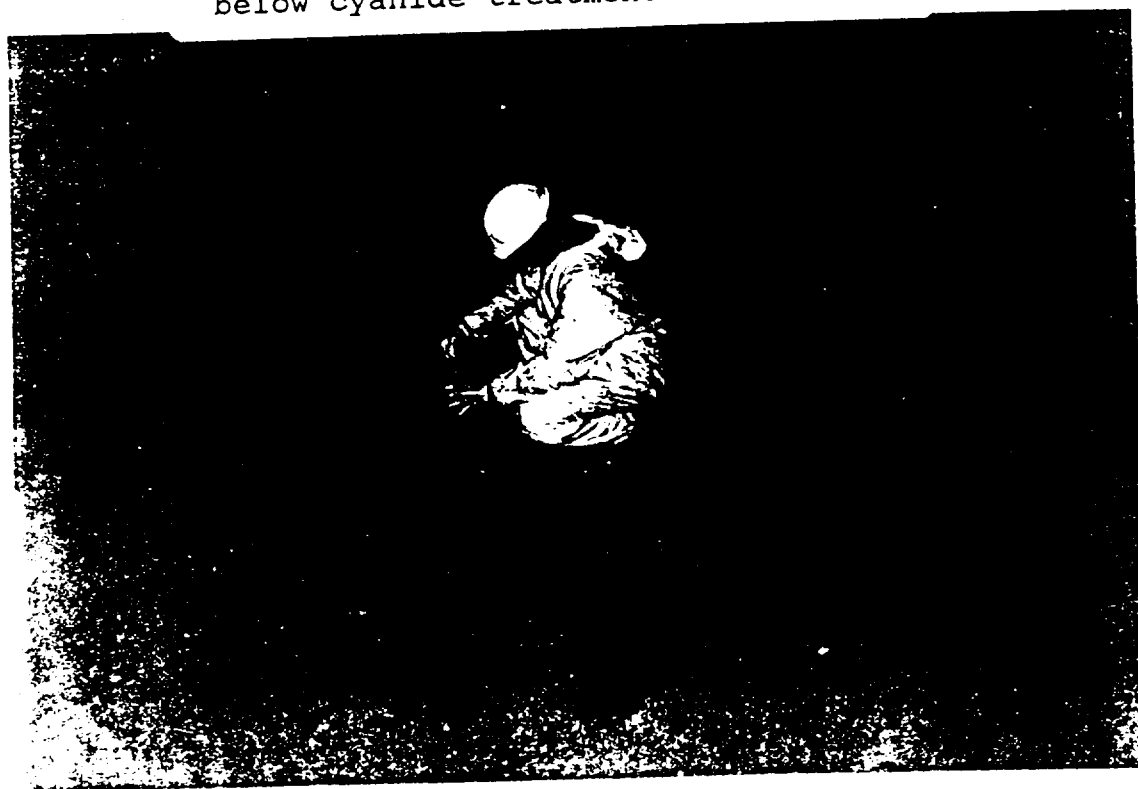
Site: General Die Casting
 Photo No: 10 Date: 2/10/92
 Direction: South
 Camera: OLYMPUS INFINITY 35mm
 Photographer: Langer
 Subject: TATM Dunderman samples
 first cyanide destruct tank. SG6



Site: General Die Casting
 Photo No: 11 Date: 2/10/92
 Direction: South
 Camera: OLYMPUS INFINITY 35mm
 Photographer: Langer
 Subject: Green sludge in Nickel
 treatment tank. SG1



Site: General Die Casting
 Photo No: 12 Date: 2/10/92
 Direction: Southwest
 Camera: OLYMPUS INFINITY 35mm
 Photographer: Langer
 Subject: White crystal on pipe
 below cyanide treatment tanks. SG5



Site: General Die Casting
 Photo No: 13 Date: 2/10/92
 Direction: West
 Camera: OLYMPUS INFINITY 35mm
 Photographer: Langer
 Subject: TATM Dunderman collects
 sample from plating sump. SG11